

COMMERCIAL SPACE TRANSPORTATION

The Federal Aviation Administration's (FAA) Office of Commercial Space Transportation (AST) licenses and regulates U.S. commercial space launch activity including launch vehicles and non-federal launch sites authorized by Executive Order 12465 and Title 51 U.S. Code, Subtitle V, Chapter 509 (formerly the Commercial Space Launch Act). Title 51 and the Executive Order also direct the Department of Transportation (carried out by the FAA) to encourage, facilitate, and promote U.S. commercial launches. AST's mission is to license and regulate commercial launch and reentry operations and non-federal launch sites to protect public health and safety, the safety of property, and the national security and foreign policy interests of the United States.

Overview

Commercial space transportation primarily consists of commercial launch service providers launching satellites and cargo into orbit for either commercial or government customers. Commercial space transportation also includes suborbital launches, where a payload or a vehicle is launched on a trajectory that briefly enters space but returns to Earth without entering orbit. Finally, it includes the reentry of objects from space to Earth.

The FAA licenses several expendable vehicles used for commercial orbital launches. The most frequently used vehicles are:

- Atlas V, a heavy-class vehicle built by United Launch Alliance (ULA), a joint venture between Boeing and Lockheed Martin, and marketed by Lockheed Martin Commercial Launch Services (LMCLS);
- Delta IV, a heavy-class vehicle and the Delta II, a medium-class vehicle, both built by ULA and marketed by Boeing Launch Services (BLS);
- Falcon 9, an intermediate-class launch vehicle built, operated, and marketed by Space Exploration Technologies Corp. (SpaceX).
- Pegasus and Taurus, two small vehicles built, operated, and marketed by Orbital Sciences Corporation (Orbital); and
- Zenit-3SL, a heavy-class vehicle built by the Ukrainian company KB Yuzhnoye for the Russian-owned Sea Launch venture, launched from a floating launch platform based at Long Beach, CA.

The medium-class Antares by Orbital is currently under development and its first launch is planned for 2013.

From 1989 through the end of 2012, DOT/FAA has licensed 212 orbital and suborbital commercial launches.

Experimental Permits, for suborbital reusable vehicle development and test flights, were first granted by the FAA in 2006 to Blue Origin and Armadillo Aerospace. Other permits have been

granted for vehicles participating in the Lunar Lander Challenge, completed in 2009. Since then, Experimental Permits have been issued to Blue Origin, SpaceX, and Scaled Composites as those companies develop new vehicles.

Eight commercial spaceports, located in six states, Alaska, California (part of Vandenberg Air Force Base and Mojave Air and Space Port), Florida (Cape Canaveral and Cecil Field Spaceport), New Mexico, Oklahoma, and Virginia, currently have FAA launch site operator licenses. Several other commercial spaceports around the United States are under development.

Review of 2012

There were five FAA-licensed orbital launches in 2012, up from one in 2011. SpaceX's Falcon 9 vehicle made two licensed launches to the International Space Station. In May, SpaceX completed its second flight under NASA's Commercial Orbital Transportation Services (COTS) program, and in October, the company launched its first flight under NASA's Commercial Resupply Services (CRS) program. Sea Launch's Zenit-3SL vehicle performed three licensed launches, which carried Intelsat 19, Intelsat 21, and Eutelsat 70B communications satellites to geostationary orbit.

	2011	2012	2013 Forecast
Licensed Launches	1	5	7-12
Permitted Launches	2	2	10-25

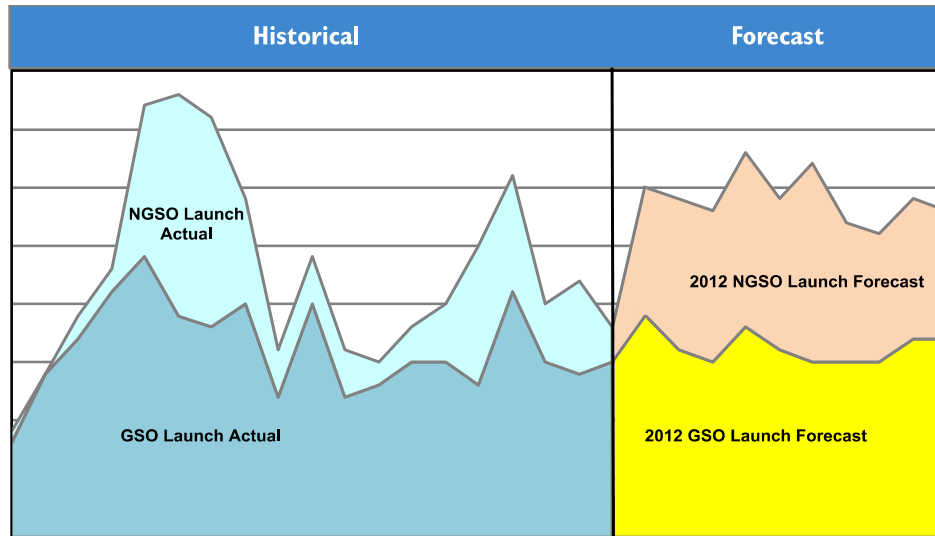
FAA Licensed and Permitted Launches, 2011-2012

Worldwide there were 20 orbital commercial launches in 2012, compared to 18 in 2011. In addition to the five FAA-licensed launches, Europe performed six commercial launches, all on the Ariane 5 vehicle. Russian conducted seven commercial launches, all on the Proton M vehicle, and China conducted two commercial launches on the Long March 3B and Long March 2D vehicles. There were 78 total worldwide commercial, civil, and military launches in 2012, with commercial launches representing approximately 26 percent of the total. For more details, see the 2012 *Year in Review* report available online at:

http://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/year_review/.

Global Forecast

In May 2012, the FAA and the Commercial Space Transportation Advisory Committee (COMSTAC) published their annual global forecast for commercial launch demand, the *2012 Commercial Space Transportation Forecasts*. The report forecasts an average of 29.1 commercial orbital launches per year of geosynchronous orbit (GSO) and non-geosynchronous orbit (NGSO) payloads through 2021. That annual average includes 16.3 launches of medium-to-heavy vehicles to deploy GSO satellites, 12.0 launches of medium-to-heavy vehicles to NGSO, and 0.8 launches to NGSO by small vehicles.



Combined 2012 GSO and NGSO Historical Launches and Launch Forecasts

Commercial GSO launches are used for communications satellites with masses ranging from 2,000 to over 6,000 kilograms. There has been an increase in the number of GSO satellites that are larger and more complex; however, there is still a demand for smaller satellites. Demand for commercial NGSO launches spans a number of markets, including commercial remote sensing; science and technology demonstration; and replenishment and replacement of low Earth orbit communications satellite systems reaching the end of their lifespan. The majority of commercial NGSO launches for science and technology demonstration missions are for nations that do not have indigenous launch capability.

The GSO and NGSO forecasts are not a prediction of what will actually be launched but instead represent the expected demand for launch services, based on a variety of inputs. The complete forecast report is available at:

http://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/forecasts/

Suborbital Reusable Vehicles Forecast

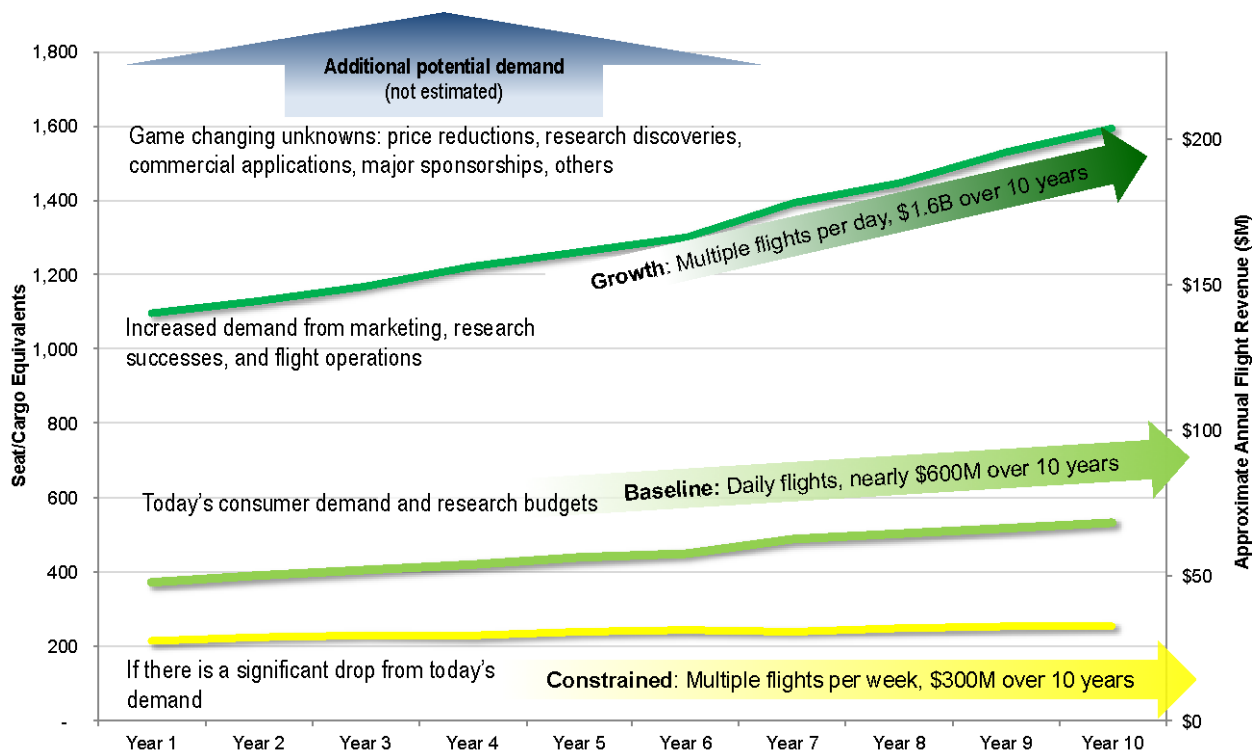
In July 2012, the FAA and Space Florida prepared forecasts of demand for suborbital reusable vehicles (SRVs) for a 10-year period. The goal of the study was to provide information for government and industry decision makers on the emerging SRV market by analyzing dynamics, trends, and areas of uncertainty in eight distinct markets SRVs could address. The eight markets include: Commercial Human Spaceflight, Basic and Applied Research, Aerospace Technology Test and Demonstration, Media and Public Relations, Education, Satellite Deployment, Remote Sensing, and Point-to-Point Transportation. Demand in each market was forecast for three scenarios: baseline, growth, and constrained. The units used are seat/cargo equivalents, translated as either one seat for a single occupant or a cargo equivalent of 3.3 lockers (based on the mid-deck lockers used aboard the Space Shuttle).

Total projected demand for SRVs, across all eight markets, grows from around 370 seat/cargo equivalents in Year 1 to over 500 seat/cargo equivalents in the tenth year of the baseline case. (Year 1 represents the first year of regular SRV operations.) Demand under the growth scenario, which reflects increases due to factors such as marketing, research successes, and flight operations, grows from about 1,100 to more than 1,500 seat/cargo equivalents over ten years. The constrained scenario, which reflects significantly reduced consumer spending and government budgets, shows demand from about 200 to 250 seat/cargo equivalents per year.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Baseline Scenario	373	390	405	421	438	451	489	501	517	533	4,518
Growth Scenario	1,096	1,127	1,169	1,223	1,260	1,299	1,394	1,445	1,529	1,592	13,134
Constrained Scenario	213	226	232	229	239	243	241	247	252	255	2,378

Total projected demand for suborbital reusable vehicles across all markets by seat/cargo equivalents

Demand for SRVs is dominated by Commercial Human Spaceflight. The analysis indicates that about 8,000 high net worth individuals from across the globe are sufficiently interested and have spending patterns likely to result in the purchase of a suborbital flight. The second largest area of demand is Basic and Applied Research, funded primarily by government agencies, and also by research for not-for-profits, universities, and commercial firms. Aerospace Technology Test and Demonstration, Education, Satellite Deployment, and Media and PR generate the remaining demand. The Remote Sensing and Point-to-Point Transportation markets are not forecasted to drive launches at this time.



For more details, see the Suborbital Reusable Vehicles: A 10-Year Forecast of Market Demand report available online at:

http://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/forecasts/